CLAIMS

1. A poly(arylene ether) polymer including polymer repeat units of the following structure:

in spec. also

$$-(O-Ar_1-O-Ar_2-O-)_m-(-O-Ar_3-O-Ar_4-O)_n-$$

where Ar_1, Ar_2, Ar_3, and Ar_4 are identical or different aryl radicals, m is 0 to 1, n is 1-m, and at least one of the aryl radicals is grafted to at least one unsaturated group that is non-aromatic and is adapted to crosslink at a curing temperature below 200°C without producing volatiles during curing and without providing functional groups after curing.

2. The polymer of claim 1, wherein one of the aryl radicals of the polymer repeat units is grafted to one unsaturated group.

3. The polymer of claim 1, wherein at least one of the aryl radicals of the polymer repeat units is grafted to more than one unsaturated group.

4. The polymer of claim 3, wherein the polymer repeat units have the following structure:

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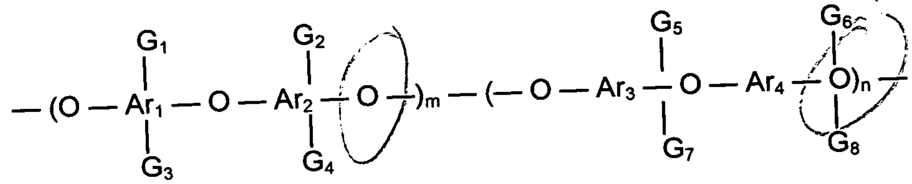


where G_1, G_2, G_3, G_4, G_5, G_6, G_7 and G_8 are identical or different species of the at least one unsaturated group.

5. The polymer of claim 1, wherein an average number of unsaturated groups per polymer repeat unit is 0.01 to 8.0.

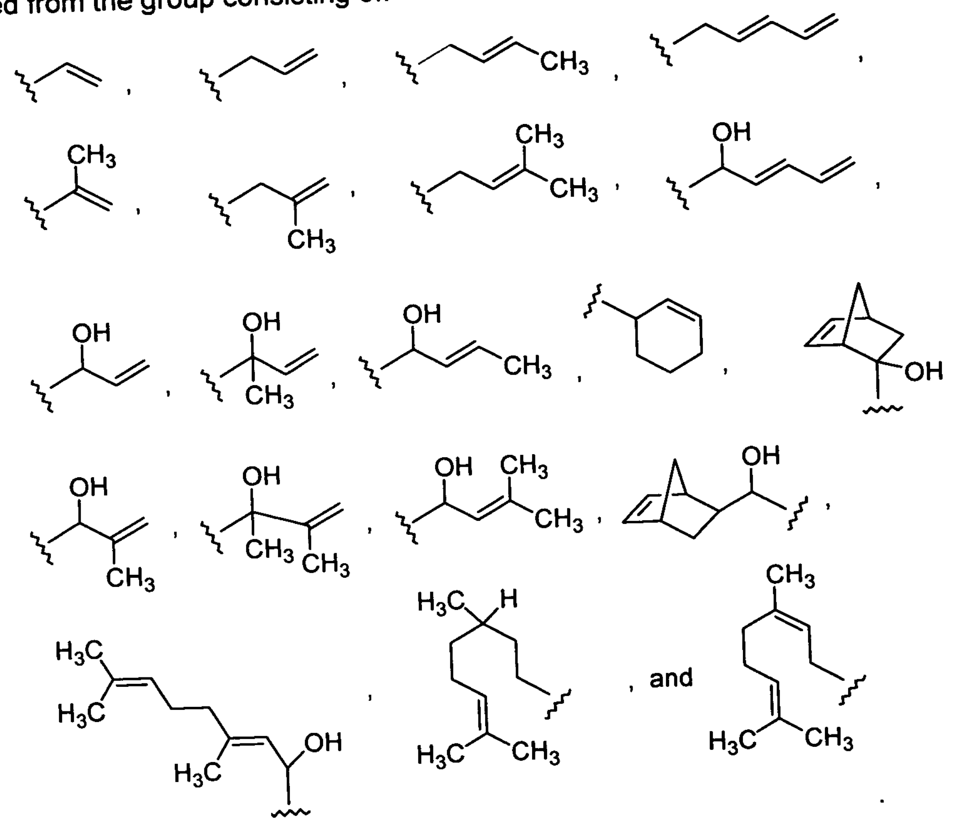
6. The polymer of claim 5, wherein the average number of unsaturated groups per polymer repeat unit is 0.01 to 4.0.

7. The polymer of claim 5, wherein the average number of unsaturated groups per polymer repeat unit is 0.25 to 1.0.

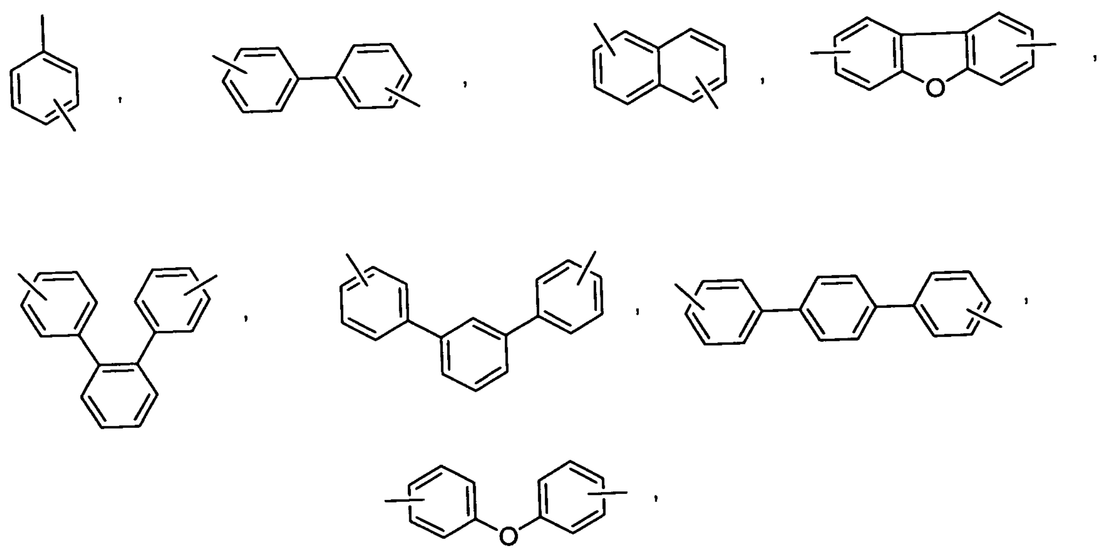
8. The polymer of claim 5, wherein the at least one unsaturated group is selected from the group consisting of an alkylene radical, an alkyldiene radical, an α-hydroxyalkylene radical and an α-hydroxyalkyldiene radical.

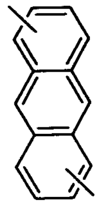
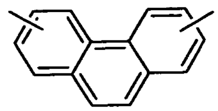
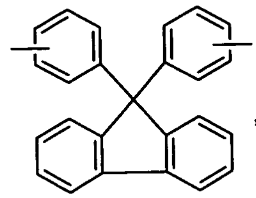
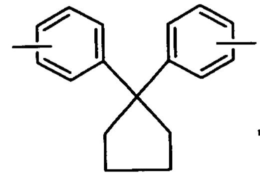
9. The polymer of claim 5, wherein the at least one unsaturated group is derived from isoprene.

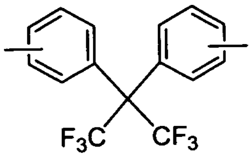
10. The polymer of claim 5, wherein the at least one unsaturated group is selected from the group consisting of:

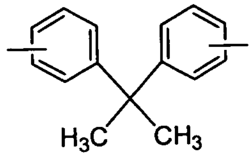


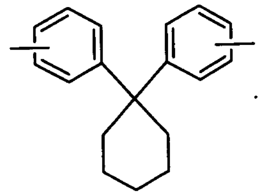
11. The polymer of claim 5, wherein the aryl radicals are independently selected from the group consisting of:



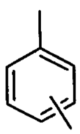
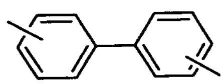
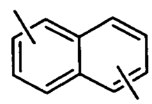
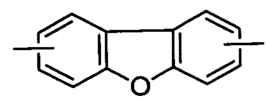
, , , ,



, 

, and .

12. The polymer of claim 7, wherein the aryl radicals are independently selected from the group consisting of:

, , , 

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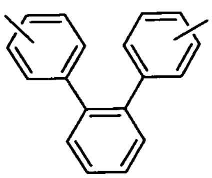
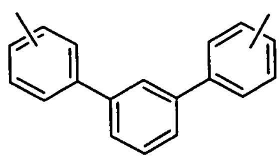
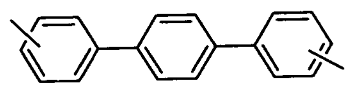
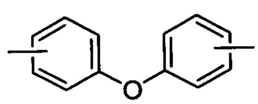
, , ,



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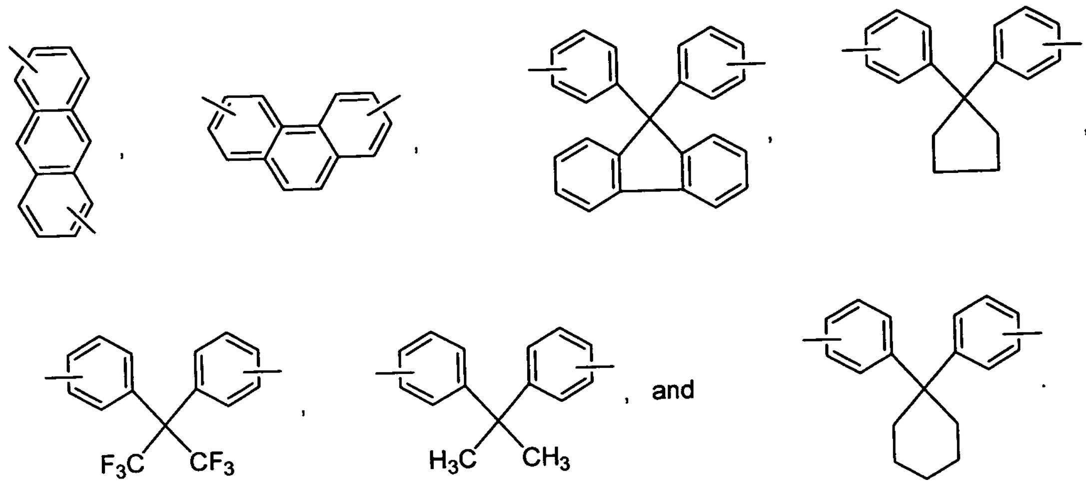
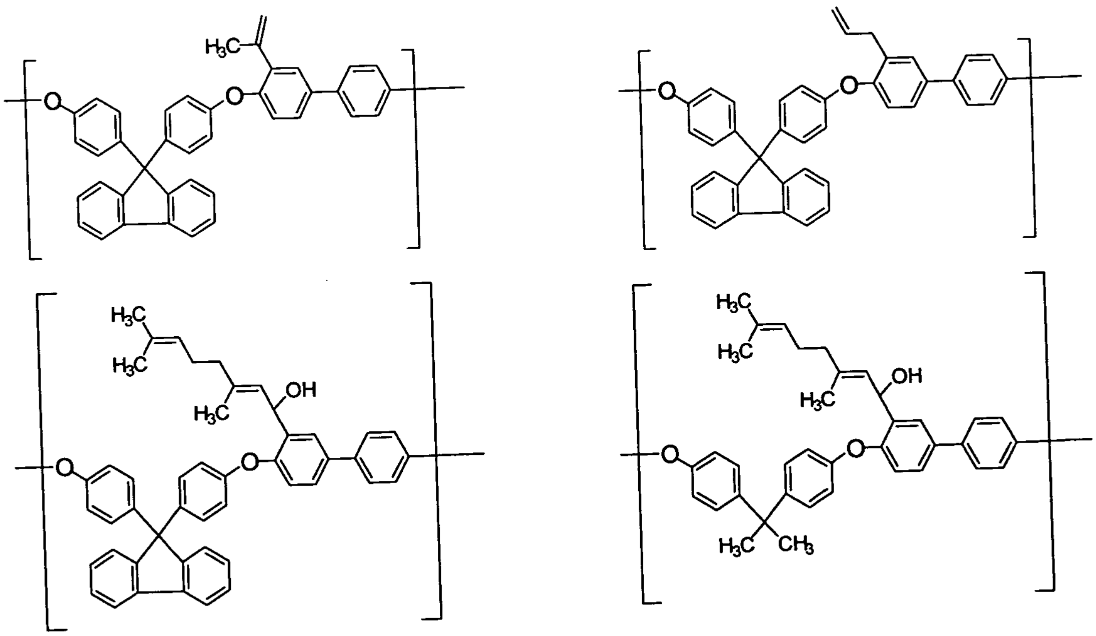
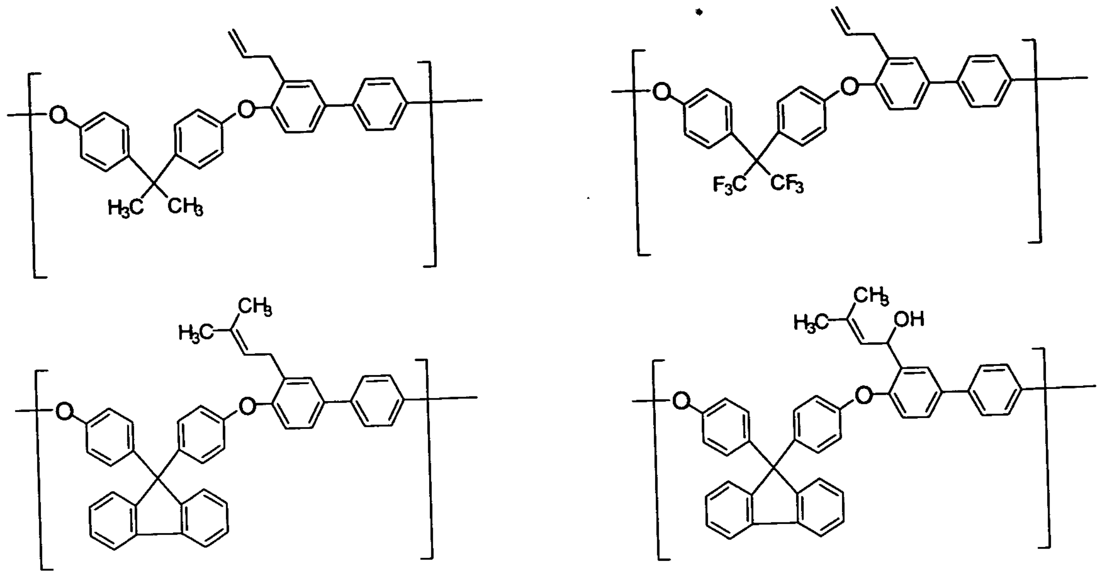


13. The polymer of claim 5, wherein at least one of the aryl radicals is selected from the group consisting of 9,9-bis(4-hydroxyphenyl)-fluorene, 2,2-diphenylhexafluoropropene and 2,2-diphenylpropene.

14. The polymer of claim 5, wherein the polymer repeat units are independently selected from the group consisting of:

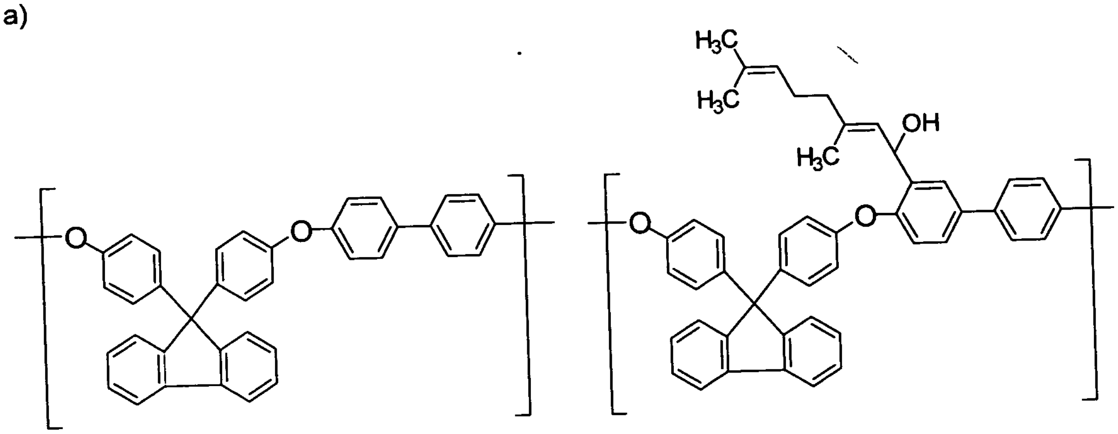




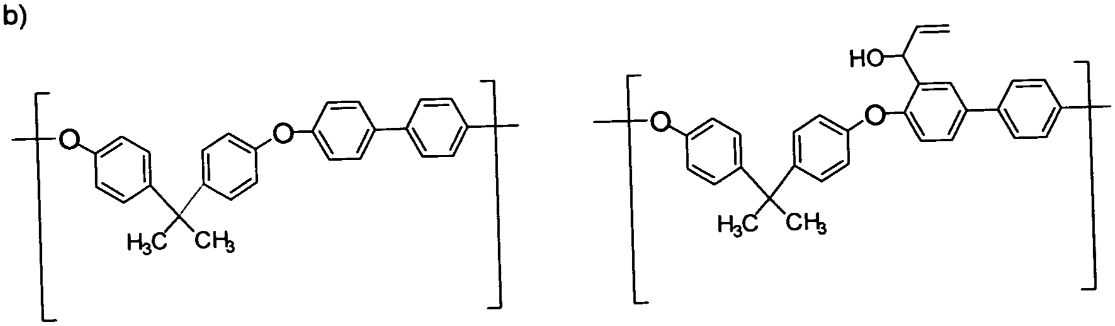
and corresponding non-grafted polymer repeat units.

15. The polymer of claim 5, wherein the average number of unsaturated groups per polymer unit is more than 0.1 and not more than 1, and the poly(arylene ether) polymer comprises one of the following polymer repeat units:

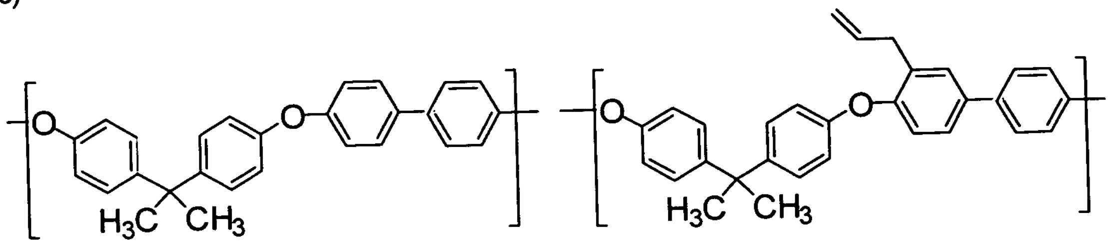
a)



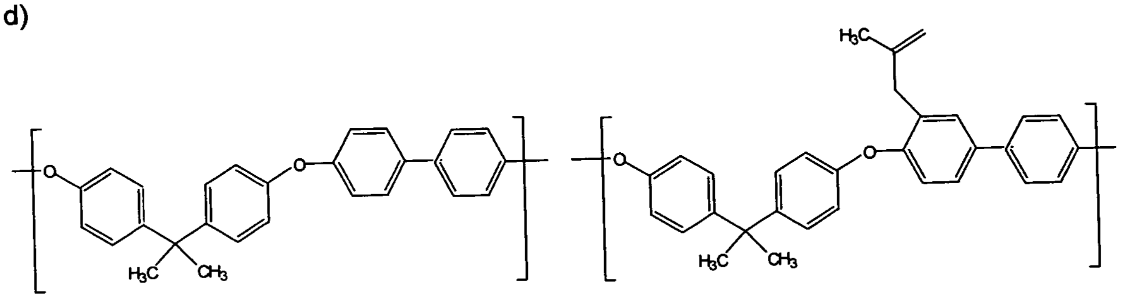
b)



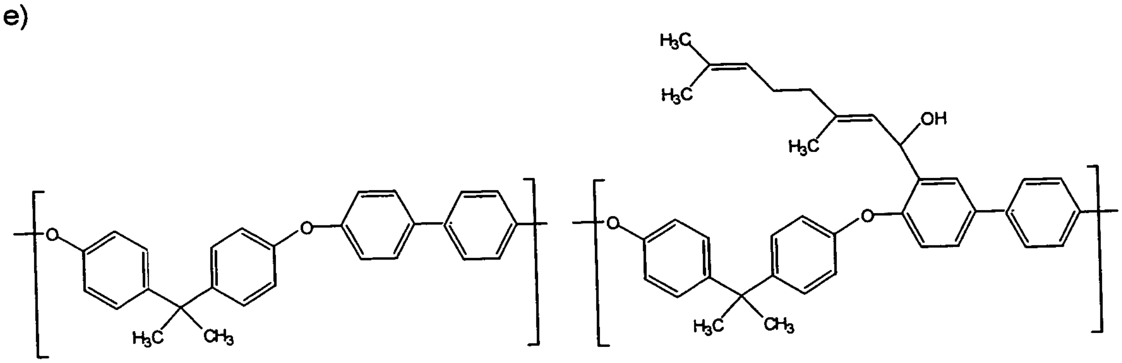
c)



d)



e)



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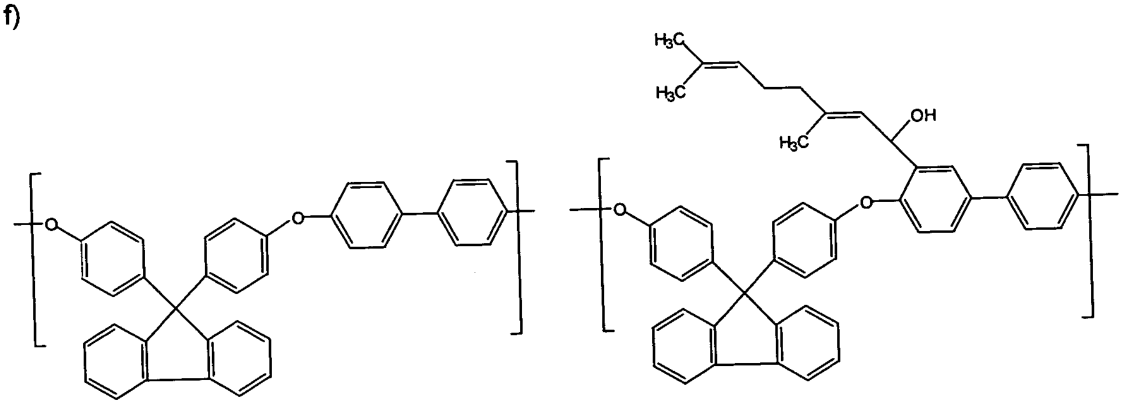
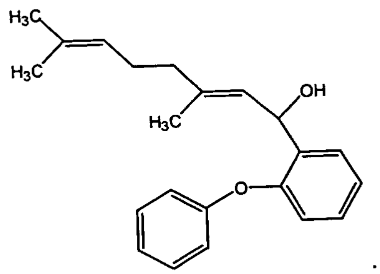
f)



16. The polymer of claim 5, wherein at least one of the aryl radicals is:



17. The polymer of claim 5, wherein m is 0.05 to 0.95.

18. The polymer of claim 5 in cured form, said cured form of the polymer having a Tg from 160 to 180°C, a dielectric constant below 2.7 with frequency independence, and a maximum moisture absorption of less than 0.17 wt%.

19. The polymer of claim 5, in an interlayer dielectric film.

20. The polymer of claim 5, in a die-attach adhesive.

21. A composition comprising the polymer of claim 1 and a diluent, wherein the diluent does not afford a functional group or interfere with mechanical or electrical properties of the composition.

22. A method for providing a substrate with a film having a Tg from 160°C to 180°C, a dielectric constant below 2.7 with frequency independence, and a maximum moisture absorption of less than 0.17 wt%, said method comprising applying the polymer of claim 1 to the substrate and heating the polymer to the curing temperature.

23. The method of claim 22, wherein the curing temperature is 170°C to 190°C.

24. The method of claim 22, wherein the heating of the polymer is conducted in the presence of a catalyst selected from the group consisting of a mineral acid, an organic acid, a free radical starter, an azoinitiator and mixtures thereof.

25. The method of claim 22, wherein the polymer is applied to the substrate in a composition further comprising a diluent that does not afford a functional group or interfere with mechanical or electrical properties of the composition.

26. The method of claim 22, wherein the film is a die-attach adhesive that bonds the substrate to a second substrate.

27. The method of claim 22, wherein the film is an interlayer dielectric that insulates the substrate from a second substrate.

28. The method of claim 22, wherein the heating of the polymer is initiated with UV radiation.